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RESULTS OF THE ARCHBOLD EXPEDITIONS. NO. 22

ON THE BREEDING HABITS OF SOME BIRDS OF PARADISE IN THE WILD

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The breeding habits of the birds of paradise have attracted much attention because of the strange and beautiful displays of the males. Most of the displays have been described, but the observations have almost all been on captive birds. The rôles of the male and female in courtship and nesting remain unknown for most species. The 1936 New Guinea Expedition spent considerable time and effort in attempting to gain information on these birds. As detailed below I found that one of the least specialized birds of paradise, *Manucodia ater*, is monagamous, and male and female share nest duties; that *Phonygammus keraudrenii* is usually seen in pairs and the male displays to the female; and that the male *Cicinnurus regius* is, for long periods, the sole occupant of a small area, one or two tree tops, in which it calls frequently and which probably is its territory.

Manucodia ater (Lesson)

At Lake Daviumbu in August and September this was a common forest species, feeding in the fruiting trees and spending most of its time in the lower parts of the forest canopy, and the tops of the lower trees. It was frequently found in pairs and was not especially wary. When nervous these birds give a quick little flit to their tail and have a deep "chug" call repeated a number of times, apparently expressing alarm or annoyance. A call, commonly heard at this camp and which I think was given by this bird was a drawn-out, whistled call and is probably similar to the "long-drawn moaning cry" recorded for *M. jobiensis* by Claude Grant (1915, Ibis, Jub. Sup., p. 9). In addition I have heard a low chattering call given at the nest (see below). In flight these birds have the heavy, silken, rustling of wings common to many birds of paradise.

On September 22, I was watching a *Manucodia* feeding in a seventy-

foot fruiting tree in the forest. Another came into the tree and was at once chased some distance, both birds disappearing from sight through the forest. Trying to locate the birds again I saw one, apparently adult, sitting in the top of a tree twenty yards from the fruiting tree. It sat there quietly some time, preening its feathers. Then another came flying through the forest to perch there below it. The first bird began to shake its slightly spread wings and tail and hopped down near the new arrival. The second bird flew to another branch ten feet away followed by the first bird. The latter again shook its wings and tail and erected its body feathers for a moment. Then both flew off through the forest. Possibly this is part of the display of this species.

During my stay at Lake Daviumbu I found two nests and was able to get some information on the rôle of the parent birds.

Nest No. 1, September 21, 1936

This was in a small leafy thirty-foot tree growing in the rain forest beside the track, where a break in the forest canopy allowed the tree the full light of the sky. The nest itself was twenty feet from the ground among the smaller branches of a lateral bough so that it had several supports and was fairly well concealed from both above and below by the foliage.

The nest itself was a deep, firm cup composed chiefly of slender, soft woody or semi-woody stems which had been bent and woven around so as to make the nest a rather neat structure. It rested on several small forking branches, but on one side some of the stems forming the nest had been carried around a small branch to anchor it more firmly. Most of the material of the nest was dead and dry, but there were a few green stems of some creeper in the bottom of it. The outside of the nest was composed of stems of a number of kinds of plants. In the bottom of the nest, after the first layer of stems, a considerable number of dead leaves had been laid flat, and on top of this was a considerable quantity of dead, dry, rotten wood. This was completely covered again by the inside layer, composed entirely of blackish, semi-woody stems, bent around, making a rather rough interior, but there was no further lining.

The nest measured: outside—250 × 140 mm. deep; inside—130 × 100 mm. deep.

The walls were 60 mm. in thickness on one side, 20 mm. and open enough to see through on the other. On one side the cup-shaped nest has a sharp edge, on the other it is carried out as a flat open-work lip.

Nest No. 2, September 12, 1936

This was in a thirty-five foot, slender, open substage tree in the occasionally flooded open forest between the lake shore and the savanna. It was twenty-five feet up, resting on a number of lateral branches of several forks and with part of the nesting material carried around one branch to anchor it more firmly. It was in a rather open place where it could be seen from 75 yards distance. It was similar in material and construction to nest No. 1, though the edge was more irregular.

Eggs

Each nest contained two eggs. The eggs from nest No. 1 were ovate in shape; shell fairly smooth with a slight gloss. In color they were more heavily marked than the egg of this species figured by Hartert (1910, Nov. Zool., XVII, Pl. x); ground color whitish, in one egg spots and dots of blackish brown are scattered over it, and with many spots overlaid with whitish to give secondary grays; some parts of the egg irregularly suffused with pale purplish gray or with yellowish brown, giving a dirty appearance to the egg. The other egg was more heavily marked, with lighter colored markings tending toward streaks, especially about the largest circumference of the egg.

Measurements.—26.8 × 39.2 mm.; 25.7 × 39 mm.

Period of Incubation

Nest No. 2, discovered on September 12, was climbed to by natives who said it contained no eggs. On September 16 there were two eggs and on September 29 there was one small young and one egg still unhatched. Thus the period of incubation is more than fourteen days and less than eighteen days.

Description of Young

Probably a day or so old. This was from nest No. 2, September 29. The young was without a trace of down. Its skin was blackish flesh, paler below; bill grayish flesh, gape white, inside of mouth, flesh; feet grayish flesh.

Actions of Young

After I kept this young one alive overnight and it had been without food for about thirty hours, it was very weak but still begged for food when disturbed. This was such a dominating urge that it begged for food even after it had fallen on its back.

Adults About the Nest

Nest No. 1.—When the natives told me of this nest on September 21, I went at once to see it, knowing what accidents can befall nests. As I approached to within twenty yards of the nest the female (?) flew off, and in a moment, followed by another bird, flew back over the nest into a tall tree nearby. For some time one bird went to and from the nest, apparently too nervous to incubate. For fear of causing it to desert the nest I hastily prepared a watching place ready for the morrow, and departed. I had seen the second bird but once and neither bird had made any sound about the nest. Next day I found that one of our boys, not knowing the nest was there, had climbed the tree and cut off the very branch with the nest, in order to examine and collect the flowers of this tree. The eggs evidently have a very tough shell as I found them both on the ground, one only slightly cracked, the other entire.

Nest No. 2.—I watched this nest several times between September 16 and September 19. At this time it contained two eggs. I sat in an exposed situation about forty yards from the nest. Both my unconcealed position and the proximity of our temporary camp only sixty yards from the nest, may have influenced the actions of the birds.

I found that I could approach to within twenty yards of the nest before the brooding bird slipped off. It returned in a few minutes to resume brooding, but if the intruder had not left it went away again and stayed away for a long period.

During the time I spent watching the nest apparently only one bird came to the nest. The periods the bird brooded and the periods it was absent from the nest are listed below:

September 16—period of observation—from 3:55 P.M.–5:17 P.M.:

Bird Brooded	Bird Absent from Nest
24 minutes	22 minutes
33 minutes	23 minutes

September 17—period of observation—from 10:10 A.M. to 1:35 P.M.:

Bird Brooded	Bird Absent from Nest
	45 minutes
51 minutes	10 minutes
21 minutes	51 minutes
22 minutes	5 minutes

During the five hours and seven minutes which I spent watching the nest, the incubating bird, presumably the female, brooded on five different occasions for intervals ranging from 21 to 51 minutes and was absent from the nest for six periods ranging from five to fifty-one minutes.

When the brooding bird left the nest it usually flew silently away out of sight through the forest away from the camp. Returning, it usually flew to several perches on its way to the nest, finally lit on the nest bough and hopped along that to the nest. It was always silent. Though I could see forty to fifty yards along the route the bird took, I did not see another bird. Presumably the female alone brooded.

Since the male did not come to the nest I attempted to find if the brooding bird joined its mate. On the afternoon of September 17, I watched along the route usually taken by the brooding bird in leaving the nest. It left the nest and flew to a big tree in the edge of the forest seventy yards from the nest. Here it gradually worked up to the top of the tree then flew one hundred yards across the small area of savanna to a yellow-flowered forest tree (*Xanthostemma*). Here it began to feed leisurely among the blooms, pecking at the flowers, with frequent pauses. After about five minutes it was joined by another bird which came hopping up from lower in the tree where I hadn't seen it. For a time both fed within a few feet of each other. Though they sometimes approached within six inches of each other they paid no apparent attention to one another. Shortly the female (?) flew a short distance to a leafy tree, followed by the other; both rested here for about five minutes, then one, followed by the other, flew to the big tree already mentioned, seventy yards from the nest. Here I couldn't see them, but shortly one flew back across the savanna, while in fifteen minutes the other came to the nest to brood. I had heard no sound from these birds during this period.

Again, on September 19, I saw the female (?) leave the nest and fly the seventy yards to the forest edge where it was joined by another bird. Both flew across savanna to forest beyond, apparently supporting the observations of September 17, that the female joined the male when she left the nest to feed.

We moved our camp on September 20 and on September 29 I returned to this nest to continue observation. I was fortunate in that, as I found later, one egg had recently hatched, while the other was nearly ready to hatch. From a "hide" of boughs about 65 yards from the nest I watched the actions of the birds.

I arrived at the nest at 8:15 A.M. and heard the female calling "chug chug - - -" before I saw it. It was sitting by the nest, nervously jerking

its tail and looking about. While I was making the "hide" the female flew about in the vicinity. Then the natives who were helping me left and the female at once returned to the nest, at 8:31. It stood looking into it for a moment, then hopped on and began to brood; twenty-two minutes later I saw a male fly into a nearby tree. In a moment the female left the nest, having brooded for forty-five minutes, and flew directly away. As it disappeared the male came to the nest, stood looking into it for a moment, then hopped on and brooded. Thirty-five minutes later the female came sailing to perch just below the nest, the male then rose off the nest and flew away. The female stood a few moments occupying itself with the contents of the nest, perhaps with feeding and nest sanitation, then settled to brood. Thirty-nine minutes later the male came sailing into the nest tree; one bird gave a low chattering call and I heard the drawn-out whistled call, given, I think, by one of these birds. Then the female left and the male went to the nest in a moment, spent two minutes in what appeared to be feeding and nest sanitation, then brooded. This established definitely that both of the pair share in the nest duties.

After a few moments I attempted to get close enough to shoot the bird, but it was wary, and though I waited another hour I was unable to secure it. The somewhat larger bird I have considered the male in the above notes.

The male sat rather quietly while brooding; the female was rather nervous and kept turning about during the period at the nest.

This species is not particular about nest sanitation and the brooding birds apparently mute over the edge of the nest. When I collected the nest I found a quantity of accumulated droppings on the branch supporting the nest.

It appears that this unspecialized bird of paradise may pair monogamously, after the manner of many passerine birds, and that the male and female share in the nest duties.

From the above the male evidently assists in brooding when the young hatch and probably in feeding the young. The earlier observations indicating that the male does not approach the nest during incubation, but stays in the vicinity and is joined by the female when she leaves the nest to feed, may represent the usual condition or it may be that the male was shyer than the female and the unaccustomed human activity near the nest frightened it so that it did not take its accustomed turn at incubation.

Phonygammus keraudrenii (Lesson and Garnot)

This was a fairly common species at Tarara, Wassi Kussa River, where it is usually found in substage trees and tree tops in the rain forest. It was usually seen singly or in pairs and came to fruiting trees to feed. Its call, commonly heard, was a loud harsh squawk, somewhat recalling the call of *Mino dumonti*.

On December 12 I heard one of these birds, and saw one, then another, fly to a large, horizontal exposed branch thirty feet up. They were male and female, judging by their difference in size. They perched a foot or so apart, the male turned toward the female and depressed the forepart of its body so that it was more or less parallel to the branch on which they sat. The male then slightly raised and spread its wings, erected its body feathers and gave a single loud, slightly prolonged harsh call, relaxing its feathers and folding its wings as it did so. Then the male moved toward the female which flew fifty yards into the forest where the performance was repeated. Apparently the chasing and display continued for some moments, though, due to the density of the foliage and frequent movements of the bird I could catch only an occasional glimpse of them. Apparently this display was given solely for the benefit of the female.

The above is evidently the mating display of this species and, from this and the fact that the species is frequently, perhaps usually, found in pairs, one may perhaps conclude that this bird is monogamous and that both male and female take part in the nest duties, as in *Manucodia*.

This conclusion is in accord with the observations on the Queensland race *P. k. gouldi*. The nest and eggs of *P. k. gouldi* have been described a number of times and in Mathews ('Birds of Australia,' XII, pp. 385–387) it is recorded that at several nests a pair of birds was present.

With the above evidence as to the nest of this species, it seems that Frost was mistaken in reporting (Rothschild, 1930, Bull. Brit. Ornith. Club. LI, p. 9) that this species had the habits of parasitic cuckoos.

Cicinnurus regius (Linnaeus)

On July 6, two miles below the Junction of the Black and Palmer rivers I spent more than half an hour trying to get a view of a male of this species which was alternately sitting quietly and then moving quickly about in a very dense substage tree.

Later, at the camp on the Fly River opposite Sturt Island, where this species was also common, I again found adult males spending much of

their time for long periods alone in a medium-sized, densely leaved, shrubby forest tree.

At one such tree near camp I first recorded a male in it on October 10 and from then to October 31, I visited this tree almost daily, and at various times during the day. Each time the male was in the tree. The presence of a fruiting liana, on the fruit of which many species of birds fed, perhaps even made it unnecessary for the bird of paradise to leave for food, though I did not see it feeding on this fruit.

Several times I watched this tree for a few hours at a time in the hopes of seeing some sort of display, but in vain. The bird spent long periods sitting quietly in the interior of the tree, frequently calling a harsh "caaar," somewhat drawn out and plaintive.

When it moved about its actions were quick and active. One of its characteristic actions was to fly down and alight on a small vertical branch or liana, and hop up it, reversing its body at each hop. I saw several other species of passerine birds in this tree and the king bird of paradise paid no attention to these intruding birds. Occasionally I shot a bird in or near this tree. The shot did not frighten the king bird of paradise from the tree; indeed sometimes the sound of the shot stimulated it to call.

Other males apparently had similar posts nearby, to which they kept, judging by their calls, which I heard day after day when at this one tree. But each male was alone in its tree.

Unable to observe another king bird of paradise come to the tree, I arranged a mounted male and a female and introduced them at different times into this tree. The results were negative. The male simply came and inspected them, then retired twenty or thirty feet from them and sat quietly watching.

When I sent a boy up into the tree, the male flew about calling a hissing "chee" of protest, returning to its tree as soon as the boy descended.

Probably this single tree, or sometimes two trees close together, represents the territory held by one male and to which the female comes to mate.